

## CANINE PRACTICE — DERMATOLOGY

A pilot study on the use of benzoyl peroxide (BPO) — with and without Novasomes™ (product A, MicroPearls™ Benzoyl Peroxide Shampoo, EVSCO Pharmaceuticals, Buena, N.J.) — in dogs with normal or wintertime dry skin was conducted. Twenty dogs with normal skin and 13 dogs with wintertime dry skin whose owners were senior veterinary students or veterinary technicians were entered into the study. Of the two BPO shampoos used (product A and product B, OxyDex® Shampoo: DVM Pharmaceuticals, Miami, Fla.), both were well-tolerated in dogs with normal skin or dogs with wintertime dry skin. Benzoyl peroxide with product A, however, was the product of choice when BPO must be applied to dogs with dry skin.

# A Clinical Study on the Effect of Two Commercial Veterinary Benzoyl Peroxide Shampoos in Dogs

Danny W. Scott, DVM  
William H. Miller, Jr., VMD  
Suzanne M. Cayatte, DVM  
Department of Clinical Sciences  
College of Veterinary Medicine  
Cornell University  
Ithaca, New York 14853

## Introduction

Benzoyl peroxide (BPO) is a diacyl aromatic peroxide derived from a byproduct of coal tar.<sup>1-4</sup> It was first used on humans as a nonirritating, oxidizing antiseptic in 1905.<sup>1</sup> Benzoyl peroxide is a potent oxidizing agent which reacts with biological materials, giving rise to benzoyl peroxy radicals which interact with hydroxy and sulfoxy groups, double bonds, and other substances, properties which allow it to disrupt microbial cell membranes.

When placed on the skin, BPO penetrates the stratum corneum and hair follicle openings, and is metabolized to benzoic acid.<sup>1,5,7</sup> It is this libera-

tion of benzoic acid, which lyses intercellular substance in the stratum corneum of the skin, which accounts for the keratolytic effect of BPO.<sup>8,9</sup> Other actions of BPO on the skin are listed in Table 1.

Since its introduction to veterinary medicine in 1976, BPO has become widely used and touted for the treatment of bacterial pyoderma and various keratinization defects (especially "seborrhea").<sup>2-5,9-17</sup> In general, 2.5 to 3% BPO is well-tolerated, producing irritant contact dermatitis reactions in only 2.5 to 5% of all patients treated.<sup>1,2,4,9-12,14,15,17</sup> Contact hypersensitivity reactions are very rare.<sup>1,2,4,9-12,14,15,17,18</sup> Other side effects of BPO include bleaching of hair and clothing.<sup>1,2,4,9,10,12,14-17</sup> Benzoyl peroxide has skin

*Continued*

tumor promoter activity in mice and hamsters, but no skin tumor initiator activity has been demonstrated in any species.<sup>18</sup>

Perhaps the most common side effect of BPO in dogs is excessive drying of the skin.<sup>9,10,14,15,17</sup> Because of this, it should be avoided in the treatment of dogs with various forms of dry skin ("seborrhea sicca"). Thus, if BPO is used to treat bacterial pyoderma in a dog with dry skin, one often has to counteract the additional drying effect of BPO by applying an emollient. This results in additional treatment time and expense.

Recently, a BPO-containing shampoo which has an emollient base has become available to veterinarians (MicroPearls™ Benzoyl Peroxide Shampoo: EVSCO Pharmaceuticals, Buena, N.J.). This BPO shampoo employs liposome encapsulation technology.<sup>19</sup> Novasome™ capsules (product A, MicroPearls Benzoyl Peroxide Shampoo, EVSCO Pharmaceuticals, Buena, N.J.) attach to hairs and skin via cationic attractions and release their contents as they naturally degrade, creating a long-lasting effect. Because of the water and fatty acid content of their walls, Novasomes tend to keep moisture levels constant, thus acting as potent humectants.

Because of previous experiences with a Novasome-containing cream rinse for dogs with wintertime dry skin, we were interested to see whether or not this technology would also allow us to use BPO in dogs with dry skin without exacerbating the dryness. The purpose of this paper is to report the results of a pilot study on the use of BPO — with and without Novasomes — in dogs with normal or wintertime dry skin.

### Materials and Methods

Twenty dogs with normal skin and 13 dogs with wintertime dry skin whose owners accepted our protocol were entered into the study. The dogs represented several different breeds, included 21 females and 12 males, varied from 1 to 9 years of age, and ranged from 4.5 to 43 kg in bodyweight. All normal dogs were owned by senior veterinary students or veterinary technicians. All dogs with dry skin were patients at the Small Animal Clinic, had a history of recurrent dry skin during winter months, and had similar degrees of clinical severity, but were otherwise healthy. None of the dogs had received any topical treatments within the last several weeks prior to entry into the trial.

Two commercial veterinary BPO shampoos were used. The products were packaged in identical 6-oz flip-top bottles labelled "A" or "B." Product

**TABLE 1**  
Effects of Topically Applied Benzoyl Peroxide on the Skin

Antibacterial
Keratolytic
Comedolytic ("follicular flushing")
Sebostatic
Degreasing
Astringent
Local anesthetic
Debriding
Increased oxygen tension
Increased healing

A (MicroPearls Benzoyl Peroxide Shampoo) contained Novasomes and product B (OxyDex® Shampoo: DVM Pharmaceuticals, Miami, Fla.) did not.

All dogs were treated with both products, twice weekly, for 3 weeks, in order to mimic a typical medicated shampoo protocol.<sup>4,9,10,14,15,17</sup> At these times, the dogs had one product applied to the left lateral thorax, and the other product applied to the right lateral thorax. Seventeen dogs had product A applied to the left lateral thorax and product B applied to the right lateral thorax. The order was reversed for the other 16 dogs.

Owners were instructed to wet their dogs' haircoats thoroughly, and then apply a measured amount of product A and product B on the designated lateral thorax. The amounts of shampoo used were as follows: 15 ml for small dogs (< 12 kg), 30 ml for medium-sized dogs (12 to 34 kg), and 45 ml for large dogs (> 34 kg). These amounts were chosen so as to mimic the amount of shampoo that the lateral thorax of these various sized dogs might be exposed to during routine shampooing. The products were applied to the designated side of the thorax, lathered well, and left in contact with the skin and haircoat for 10 minutes. The areas were then rinsed well and towel dried. No other treatments were allowed during the 3-week study period.

All owners were given a detailed treatment evaluation form to be used during the 3 weeks of the study. The following criteria were evaluated before beginning therapy, and at the end of the 3-week study period: scaling, erythema, pruritus, and coat quality. Improvements or exacerbations in these parameters were graded as mild, moderate, or marked. In addition, owners were asked to note any apparent adverse reactions. All dogs

*Continued*

were treated at home by the owners, and all follow-ups were conducted by conversation with the owners.

**Results**

Seven of 20 dogs with normal skin and 3 of 13 dogs with wintertime dry skin were dropped from the study because of owner noncompliance. Results on the 13 dogs with normal skin that completed the study are shown in Table 2. In seven of the dogs (53.8%) there were no changes observed with either product. In six dogs (46.2%), the skin developed abnormalities with one or both of the products. Five of these six dogs developed mild scaling, erythema, or pruritus: three dogs with MicroPearls only, two dogs with both products. Only one of the dogs developed marked scaling, and that was with OxyDex.

Results on the 10 dogs with dry skin that completed the study are shown in Table 3. Seven of the 10 dogs (70%) realized a marked reduction in scaling, while two dogs worsened and one dog was unchanged. Of the seven dogs that improved, five improved only with MicroPearls. One of the dogs that worsened developed severe erythema and pruritus 48 hours after the second application of both products. After talking with the owner and the referring veterinarian, it was discovered that the dog had been treated with a BPO shampoo about 1 year ago for a superficial bacterial pyoderma. Contact hypersensitivity to BPO was tentatively diagnosed, and the dog was withdrawn from the study.

There was no apparent relationship between response to the BPO shampoos and breed, age, or sex of the dogs with normal skin or wintertime dry skin.

**Discussion**

The efficacy of BPO shampoos as antibacterial agents is well-documented<sup>2-4,9-17</sup> and was not the subject of this pilot study. Our interest was in the relative drying effects of two different commercial veterinary BPO shampoos — one with added humectant properties, one without — on normal dog skin and dogs with wintertime dry skin. Although the number of dogs studied was small, one definite trend emerged: BPO with humectant (product A, MicroPearls) was superior to BPO without humectant (product B, OxyDex) in dogs with wintertime dry skin.

Seven of the 10 dogs (70%) improved dramatically with MicroPearls, while only two of 10 (20%) improved with OxyDex.

**TABLE 2**  
Results of BPO Shampoos on Dogs With Normal Skin

Case	Remarks
1	No change
2	Mild increase scaling, erythema, and pruritus with A <sup>a</sup>
3	Mild increase scaling, erythema, and pruritus with A
4	Mild increase erythema with A
5	No change
6	No change
7	Mild increase scaling with A and B <sup>b</sup>
8	No change
9	Marked increase scaling with B
10	No change
11	Mild increase scaling with A and B
12	No change
13	No change

<sup>a</sup>MicroPearls™  
<sup>b</sup>OxyDex®

**TABLE 3**  
Results of Benzoyl Peroxide Shampoos on Dogs With Dry Skin

Case	Remarks
1	Mild increase scaling, erythema, and pruritus with A <sup>a</sup> and B <sup>b</sup>
2	Severe erythema and pruritus 48 hours after second application of A and B
3	Marked decrease scaling with A and B
4	Marked decrease scaling with A
5	Marked decrease scaling with A
6	Marked decrease scaling with A
7	Marked decrease scaling with A
8	No change
9	Marked decrease scaling with A
10	Marked decrease scaling with A and B

<sup>a</sup>MicroPearls™  
<sup>b</sup>OxyDex®

The data in the dogs with normal skin are more difficult to interpret. At first glance, the number of adverse reactions — six of 13 dogs (46.2 %) — seems quite high; however, in five of these six dogs, the side effects consisted of mild scaling, erythema, or pruritus. These reactions were not alarming to the owners, and did not constitute a reason for stopping the shampoos. Two comments

*Continued*

seem appropriate here. First, these side effects were recorded by owners who were either senior veterinary students or veterinary technicians, and who are arguably better observers of minor cutaneous changes than the average person. Second, since BPO shampoos are usually applied to dogs who have varying degrees of inflammatory skin disease, any mild side effects would likely not be appreciated as the more severe disease-related inflammatory skin changes regressed. It is curious that three of the five dogs which developed mild scaling, erythema, or pruritus did so only with MicroPearls, the product that was best tolerated in dogs with wintertime dry skin. The authors have no explanation for this observation.

In general, the BPO shampoos used in this study were well-tolerated. Only two of 23 dogs (8.7%) experienced alarming adverse reactions. One normal dog developed marked scaling with OxyDex. One dog with wintertime dry skin developed severe erythema and pruritus 48 hours after the second application of both products. This dog probably had a contact hypersensitivity reaction to BPO, which is rarely recognized in humans<sup>1,18</sup> and has been previously suspected in dogs.<sup>2</sup>

When we originally designed and completed this study, OxyDex did not contain humectants. Interestingly, it has been recently reformulated and now does contain such agents; however, the humectant technology used in OxyDex is quite different than the Novasome technology used in MicroPearls and remains unproven.

An arguably major limitation of this study is the fact that results are based solely on owner observations. On the other hand, the owners were either veterinary students or veterinary technicians in the case of the dogs with normal skin, or lay persons who had attempted to deal with wintertime dry skin in their pets for a number of years with a number of different topical products. We feel that these owners were quite reliable.

### Conclusion

The two BPO shampoos used in this study (MicroPearls and OxyDex) are, in general, well-tolerated in dogs with normal skin or dogs with wintertime dry skin. Although 46.2% of the dogs with normal skin had adverse cutaneous reactions after six shampoos, these adverse reactions were mild (mild degrees of scaling, erythema, or pruritus), not alarming to the owners, and did not constitute a reason for stopping the shampoos in 83.3% of the dogs. Based on the results of this pilot

study which, in turn, was based solely on owner observations, BPO with Novasome humectant (MicroPearls) is the product of choice when BPO must be applied to dogs which have dry skin. ■

### REFERENCES

1. Cotterill JA: Benzoyl Peroxide. *Acta Dermatovenereol (Stockholm) Suppl* 89:57-63, 1980.
2. Reyss-Brion DA: Benzoyl Peroxide (OxyDex) Therapy of Canine Pyoderma. *Vet Dermatol News* 11(1 & 2):5-8, 1987.
3. Thomson WD, Mandy SH: Benzoyl Peroxide — A New Topical Agent for Canine Dermatology. *Vet Med Small Anim Clin* 71:1059-1062, 1976.
4. Scott DW: Clinical Assessment of Topical Benzoyl Peroxide in Treatment of Canine Skin Diseases. *Vet Med Small Anim Clin* 74:808-811, 1979.
5. Kietzmann M, Bigler B, von Tscharnner C, Heilmann HH, et al: Untersuchungen zur Verträglichkeit, Wirkung im Epidermalen Stoffwechsel und Metabolisierung von Benzoylperoxid beim Hund. *Kleintierpraxis* 35:31-34, 1990.
6. Nacht S, Yeung D, Beasley JN, Anjo MD, Malbach HI: Benzoyl Peroxide: Percutaneous Penetration and Metabolic Disposition. *J Am Acad Dermatol* 4:31-37, 1991.
7. Wester RC, Patel R, Nacht S, Leyden J, et al: Controlled Release of Benzoyl Peroxide From a Porous Microsphere Polymeric System Can Reduce Topical Irritancy. *J Am Acad Dermatol* 24:720-726, 1991.
8. Fanta D, Bardach H, Potschek C: Investigations on the Bacteriostatic Effect of Benzoyl Peroxide. *Arch Dermatol Res* 264:369-371, 1979.
9. Kwochka KW: Rational Shampoo Therapy in Veterinary Dermatology. *Proceedings of the Annual Kal Kan Symposium on the Treatment of Small Animal Disease* 11:87-95, 1988.
10. Muller GH, Kirk RW, Scott DW: *Small Animal Dermatology*, ed 4. Philadelphia, WB Saunders Co, 1989.
11. Bourdeau P: Thérapeutique Antibactérienne des Pyodermites des Carnivores. *Rec Med Vet* 166:335-343, 1990.
12. Lloyd DH, Reyss-Brion A: Le Peroxyde de Benzoyle: Efficacité Clinique et Bactériologique dans le Traitement des Pyodermites Chroniques. *Prat Med Chirurg Anim Cie* 19:445-449, 1984.
13. Alhaidari Z: L'Antisepsie Cutanée. *Prat Med Chirurg Anim Cie* 23:525-527, 1988.
14. Ihrke PJ: Topical Therapy — Specific Topical Pharmacologic Agents. *Dermatologic Therapy (Part 2)*. *Comp Cont Ed* 2:156-164, 1980.
15. Scott DW: Topical Cutaneous Medicine, or "Now What Should I Try?" *Proceedings of the American Animal Hospital Association* 46:89-101, 1979.
16. Kwochka KW, Kowalski JJ: Prophylactic Efficacy of Four Antibacterial Shampoos Against *Staphylococcus Intermedius* in Dogs. *Am J Vet Res* 52:115-118, 1991.
17. Miller WH Jr: *Antisebothetic Agents in Dermatology*. Ed by RW Kirk. In: *Current Veterinary Therapy*, ed 9. Philadelphia, WB Saunders Co, 1986, 596-601.
18. Hogan DJ: Benzoyl Peroxide. Carcinogenicity and Allergenicity. *Int J Dermatol* 30:467-470, 1991.
19. Pusieux F, Delattre J: *Les Liposomes*. Paris, Lavoisier, 1985.
20. Scott DW, Miller WH Jr, Wellington JR: A Clinical Study on the Efficacy of Two Commercial Veterinary Emollients (MicroPearls and Humilac<sup>®</sup>) in the Management of Wintertime Dry Skin in Dogs. *Cornell Vet* 81:419-424, 1991.

REPRINTS of this article may be obtained from the author **ONLY IF** a self-addressed return envelope is enclosed.